Gigantic Enhancement of Magneto-Chiral Effect in Photonic Crystals

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We theoretically propose a method to enhance dramatically a magneto-chiral(MC) effect in photonic crystals. The MC effect is a directional birefringence even for the unpolarized light. This effect occurs in a material such as $GaFeO_3$[1] in which both time-reversal and inversion symmetries are simultaneously broken. Unfortunately the wavevector dependence of a dielectric function due to the MC effect is typically the order of 10^{-6}, which is too small to be observed experimentally. We investigate the MC effect in two kinds of one-dimensional structures; (i) multilayers and (ii) stripes composed of the magneto-chiral medium and air. In both cases, the difference in the reflectivity with respect to different magnetization configurations is thousands of times enhanced compared with that in a bulk material.

[1] M. Kubota *et al*., Phys. Rev. B **92**, 137401 (2004).